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Exercise adherence in sedentary university employees after an 8-week web-based intervention

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Exercise Adherence in
Sedentary University Employees
After an 8-Week Web-based Intervention

By

Summer Huntington

Accepted in Partial Completion
Of the Requirements for the Degree
Master of Science

Kathleen Kitto, Dean of the Graduate School

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MASTER'S THESIS

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Summer Huntington
November 2012

Exercise Adherence in
Sedentary University Employees
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A Thesis Presented to the Faculty of
Western Washington University

In Partial Fulfillment of the Requirements
for the Degree Master of Science

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ABSTRACT

Worksite health promotion has received attention from many researchers in an effort to find cost effective ways to improve employee health. If a simple web-based intervention is found to increase exercise adherence among sedentary adults, it may be a useful tool in improving the health of the workforce. **PURPOSE:** The purpose of the study was to investigate the effect of a web-based intervention on biometric measures related to exercise adherence, as well as the Stage of Change in sedentary university employees over an eight week period. **METHODS:** Thirty three sedentary adults were recruited from WWU university staff and faculty to participate in an eight week study. A treatment group (N=22) received access to a web portal for tracking physical activity and attended four bi-weekly workshops on starting a new exercise program, and a control group (N=11) which received no treatment. Both groups were tested pre and post intervention for body mass index, waist to hip ratio, six minute walk test, weekly physical activity levels and Stage of Change. The study design was a mixed ANOVA with one repeated factor (time) and one fixed factor (intervention), with an alpha level of 0.05. **RESULTS:** The results revealed a significant difference in Stage of Change in the treatment group over time. The treatment group moved from a Stage of Change score of 3.4 ± 0.9 before the intervention, and increased to 3.7 ± 0.9 after the 8 week intervention, while the control group averaged 3.0 ± 0.1 before the intervention and averaged 3.1 ± 0.1 post-intervention. There was a significant difference between the two groups in the post test ($F[1,30]=7.895$, $p=0.009$). However, no other variables reached statistical significance between groups or over time. **CONCLUSIONS:** The web-based intervention was not effective in increasing changing biometric measures associated with exercise adherence among sedentary university employees.

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Chapter I

The Problem and Its Scope

Introduction

American society has adopted a more sedentary lifestyle in the 21st century due to modern technological conveniences combined with the forty hour work week. The Center for Disease Control estimates that age-adjusted leisure-time physical activity ranges from 10.1%-43.0% for all counties in the United States (Center for Disease Control, 2011). According to Mokdad, Marks, Stroup & Gerberding (2000), poor diet and physical inactivity were the second leading cause of premature death (400,000 deaths) in the United States. Increasing physical activity is one of the most effective lifestyle changes that can help reduce these figures. There is a need for a preventative approach to health, and increasing physical activity is one of the least expensive and most practical ways to improve the condition of the body.

Regular cardiovascular exercise has been shown to decrease the risk of cardiovascular disease, musculoskeletal diseases, obesity, and mental health problems (Blue & Conrad, 1995). Since people spend the majority of their day at work, or commuting to and from, it is vital for employers to facilitate physical activity for their employees. The rationale behind promoting health and wellness at work is that it will decrease the healthcare costs related to poor health, increase productivity, decrease absenteeism, and boost employee morale (Haines, et al., 2007). Worksites have taken the initiative to offer fitness programs to help improve the health of their employees. However, dropout rates for exercise interventions average 50% during the first six months (Robison, et al., 1990).

Despite the movement toward increasing physical activity options in the workplace, low exercise adherence prevents people from obtaining the full benefits of habitual exercise (Hallam

& Petosa, 2004). It is crucial to understand the many factors that contribute to developing the behavior of habitual exercise in order to decrease the current impact that lifestyle related diseases have on American society. Long term exercise adherence is a multi-faceted issue. The suggestion of providing a web-based tracking system and reminder emails is of interest in improving exercise adherence in an increasingly computer oriented workforce (Pratt, Janzio, Tomlinson, Kang & Smith, 2006). Also of interest is providing exercise education workshops, emphasizing goal setting and self-monitoring (White & Jacques, 2007). Individuals treated with a unique intervention of this nature may experience the health benefits associated with adhering to exercise. The aim of the intervention is to encourage adoption of an active lifestyle which will improve biometric measures related to metabolic diseases and exercise adherence, resulting in a healthier workforce.

Purpose of the Study

This study was conducted in order to assess the effectiveness of a bi-weekly workshop intervention (four sessions) combined with a web-based tracking tool on the exercise adherence of sedentary college faculty and staff over an eight week period. This intervention was named the Fitness Challenge, which characterizes the aim of the treatment: challenging participants to increase their fitness levels. The intensity, mode, duration, and frequency of aerobic exercise was determined by the 7-day Physical Activity Recall Questionnaire. Baseline and follow up measurements for work capacity were assessed using the 6-minute walking test and a heart rate monitor.

Hypothesis

The null hypothesis is that there is no difference in time spent in physical activity, exercise adherence, and biometric measures in individuals who receive a unique web-based and workshop intervention and those who do not receive such an intervention.

Significance of the Study

Understanding the factors affecting exercise adherence has been an important area of research in the field of worksite health promotion for many years. As the number of premature deaths due to modifiable lifestyle risk factors increases, so does the demand for more knowledge about improving exercise adherence in working adults. Regular aerobic exercise and resistance training is very important to for cardiovascular health and to prevent excessive weight gain that can lead to other health problems (Macera, et al., 2001). Worksites can promote physical activity within the company, or ignore the issue of physical inactivity until it is too late and health care costs become unmanageable. Therefore, finding effective and affordable exercise interventions in the workplace is a valuable endeavor. It has yet to be determined if exercise adherence can be enhanced with a web-based tracking tool integrated with a bi-weekly educational workshop.

Limitations of the Study

There are various factors that may affect the findings of this study. These include, but are not limited to:

- 1) Subjects were self-selected from the population of staff and faculty members from a university. Subjects completed a physical activity readiness to change questionnaire to assess this effect on adherence to exercise.
- 2) Self-selection from a single university also makes the generalization of the findings to a larger population difficult.

- 3) The exercise history of the subjects is not known. Individuals with an extensive exercise history may be able to overcome barriers to exercise easier than those with no exercise history.
- 4) The age of the subjects could affect exercise adherence. Older adults must address unique challenges of adopting physical activity and younger subjects may be more apt to engage in regular physical activity because the physiological responses are more bearable on a young body. (Chao, Capri, Foy, & Farmer, 2000)
- 5) Self reporting of the subjects can greatly influence the findings of this research. The ability of the 7-day physical activity recall instrument to accurately track physical activity is greater for more vigorous physical activity than for lower intensity physical activity (Richardson et. al, 1998).
- 6) There could be bias in the control group. These individuals may be encouraged to exercise by gaining knowledge of accessible fitness programs on campus. In addition the “stage of change” of control participants may move closer to adopting an active lifestyle than treatment participants after the pre-testing. The control group may be affected by the outcomes of their physiological measurements.

Definition of Terms

Aerobic exercise: activities that use oxygen for energy production (Cahalin et al., 1996).

Barriers to Exercise: obstacles that cause individuals to be inconsistent with exercise. Some barriers include injury, lack of direction, unrealistic goals, inability to progress, lack of professional guidance, lack of support, and unrealistic expectations with respect to weight loss (Keele-Smith & Leon, 2003).

Estimated $\dot{V}O_2$: the volume of oxygen utilized during exercise, and prediction of peak oxygen consumption from the six minute walk test based on equation with minimal clinical information, (Cahalin et al., 1996).

Exercise: a subset of physical activity that is planned, structured, and repetitive, and has a final or an intermediate objective of the improvement or maintenance of physical fitness (Blue & Conrad, 1995).

Exercise adherence: habitual exercise behavior. An individual is considered to be in a maintenance stage when the behavior has been sustained for 6 months or longer (Blue & Conrad, 1995). Adherence in this study is defined as accomplishing at least 150 minutes of physical activity outside of working per week which is 30 minutes a day at least 5 days a week.

Moderate aerobic activity (4 METS): aerobic exercise performed at intensity similar to walking briskly (Kamininsky et al., 2006).

Premature death: measures the loss of years of productive life due to death before age 75 (CDC, 1985).

Sedentary: individual who does not engage in any regular physical activity, and spends large quantity of time sitting (Mokdad et. al, 2004).

Self-efficacy: the individual's beliefs in his/her capabilities to execute a plan of action, the effort expended on the activity, and the degree of persistence that they show when faced with failure (McAuley, Courneya, Rudolph, & Lox, 1994).

Stages of Motivational Readiness to Change (SMRC) model: postulates that behavior change is a longitudinal process described by five stages that assess an individual's motivational level relative to changing leisure time physical activity behavior. Individuals are positioned in one of the following five stages at any given point in time: (a) pre-contemplation (i.e., no

intention to change); (b) contemplation (i.e., considering a change); (c) preparation (i.e., small changes already made toward an ultimate behavior goal); (d) action (i.e., a desired behavior has been adopted); or (e) maintenance (i.e., working to prevent a relapse) (Crenshaw, 2007).

Vigorous aerobic activity (10 METS): aerobic exercise performed at intensity similar to jogging (Kamininsky, et al., 2006).

Web-based intervention: a simple web portal that provides a way to track the day physical activity was performed, the intensity of the exercise, the time spent in physical activity, and the type of physical activity. Also included in the web-based intervention is a calendar with physical activity options available on campus as well as weekly reminder emails to engage in physical activity and track it on the web.

Chapter II

Literature Review

Introduction

This chapter presents a review of the literature on exercise adherence among adults and the effects of worksite interventions on increasing exercise adherence. The benefits of regular exercise are well documented, yet less than half of the US adult population is exercising enough to obtain these health benefits (Macera, et al, 2001). Interventions at the workplace tend to produce a positive change in exercise behavior (Hallam & Petosa, 2004). Improved physical fitness has been shown to result in fewer worker injuries, fewer absences from work due to illness, and increased worker productivity (Blue & Conrad, 1995). Since the long term benefits of exercise can only be realized with adherence to an exercise protocol or plan, researchers have examined different models to enhance exercise adherence in worksite based fitness programs (Blue and Conrad, 1995).

This chapter is divided into five main parts 1) literature on worksite health promotion in large organizations and the rationale for programming, 2) studies on worksite exercise interventions and their effect on exercise adherence, 3) literature on exercise adherence among adults and the psychological constructs associated with habitual physical activity, 4) studies on web-based interventions to increase physical activity and their effective outcomes, 5) validation of the instrument used to estimate minutes spent in physical activity and predict estimated maximal $\dot{V}O_2$

Worksite Health Promotion

Researchers have examined health promotion programming in businesses in order to characterize and quantify health promotion awareness and activities among small, medium and large businesses (McMahan, Wells, Stokols, Phillips, & Clitheroe, 2001). A telephone survey or Wellness Appraisal was conducted with questions in each of six categories: awareness of health promotion programs, assessment of the quantity and participation rate of health promotion activities, health related policies, employee benefits, economic status and demographic data. The participants included 1,846 persons in charge of workplace safety, health promotion, human resources or personnel, and businesses were identified as small (2-14 employees), medium (15-100 employees), and large (100-500 employees). Only 50.1% of the companies had at least one “traditional” health promotion program (e.g. fitness, nutrition, smoking cessation). Less than one third (32%) had a written health promotion plan, and even less (30%) monitored their health promotion programs. Smaller companies offered significantly fewer health promotion activities than larger companies ($p < .000$), but their participation rates were significantly higher in weight management and ergonomic programs which suggests that they are open to health promotion programs but have little access. The authors note that support from top level management is crucial to worksite health promotion program success. Improving worksite wellness reach in smaller businesses was seen as being essential to improving the health of the US population.

Researchers conducted a retrospective study to determine the relationship between wellness participation and absenteeism and medical claims costs at United Power Association, a small electrical corporation (Astrup, McGovern & Kochevar, 1992). The time period studied was three years prior and three years post wellness program offerings that focused on weight loss, physical activity, hypertension awareness, and smoking cessation. Data were gathered

voluntarily from 152 employees using a specific questionnaire addressing involvement in worksite wellness activities, involvement in personal wellness activities, predisposing risk factors, and demographic data. The benchmark for the influence of worksite wellness was set at 4 hours of absenteeism per year and a tenfold increase in insurance claims (e.g. from \$10 to \$100). Both constructs were meaningful to the employer and the researcher. Health risk profiling in this study revealed 33% of employees had high stress, 15% had hypertension, and 86% were overweight. A repeated measures ANOVA evaluated differences across participation (low, moderate, and high) and age (young, middle age, and older). The results indicated there were increased insurance claims for all employees except middle age employees with moderate and high participation rates. There was no change in employee absenteeism, nor was there a difference between groups. The authors supported that benefits of wellness programming may not appear until 20 or 30 years later in life which make it difficult to measure the success of worksite health promotion. Based on the observed effect on middle age employees with moderate and high participation rates, wellness programming has the potential to contain the costs of insurance claims associated with high risk factors. This study demonstrates that a company focusing on the high risk groups and providing a specific behavioral change intervention with focused goals may not see the results until many years later.

Goetzel and colleagues (1998) compared the total and lifestyle related medical costs of employees, participants and non-participants, in a worksite health promotion program of a large corporation in a cross sectional study over three years. The study population included 3,993 participants and 4,341 non-participants whose age and gender were adjusted in the statistical analysis. Participants completed a health profile questionnaire during the three year period and participated in follow up high risk interventions. Those who had risk factors such as elevated

blood pressure, elevated cholesterol, cigarette smoking, lack of physical activity, poor diet, or high stress were provided with one-on-one counseling and behavior change support. The risk factors associated with heart disease were communicated and a health improvement action plan was designed. The program was well rounded with noon and after work exercise programs, lunch hour educational programs, health screenings, and use of incentives. The effects of time and participation were examined using a 2 X 3 repeated measures ANOVA with a least square means to calculate age and gender adjustment. These statistical adjustments are rare in health care cost evaluation studies focused on worksite health promotion (WHP). Lifestyle-related medical costs were calculated to be \$2.3 million, \$2.5 million, and \$3 million annually for the first second and third year of the study, respectively. After the third year, the non-participants total annual medical costs and lifestyle related medical costs were 29% and 36% higher than WHP participants, respectively. The authors concluded that participation in structured WHP contributed to lower overall medical costs and lifestyle related medical costs primarily because of the systematic identification of high risk individuals coupled with intense behavioral change interventions.

Researchers set out to determine the return on investment (ROI) for participants in Highmark Employee Wellness Programs by evaluating the impact of program participation on four years of healthcare costs (Naydeck, Pearson, Ozminkowski, Day, & Goetzel, 2008). Program participants (n=1892) from three different sites were matched based on age, gender, baseline health expenditures, evidence of heart disease or diabetes, and Charlson's Comorbidity Index scores. The company initiated a comprehensive wellness program free of cost that included a health risk analysis (HRA), online programs in nutrition, weight management, and stress management, smoking cessation programs, on-site nutrition and stress classes, biometric

screenings and various six to 12 week campaigns to increase fitness as well as awareness of disease prevention strategies. In addition, a state of the art fitness center was available at two sites. To evaluate the impact on these programs, participants were divided into three groups: completion of a HRA only (n=338, HRA only group), completion of a HRA and participation in online, group or individual health improvement sessions (n=522, HRA and other group), and employees who completed a HRA, used the fitness center, and who may have also participated in another program (n=1031, HRA and fitness center group). Results showed that participating individuals across all groups had slower rate of growth in total health care expenditures with a savings of \$176.47 per person per year ($p=0.037$). Statistically significant savings of \$151.36 in the HRA and fitness center group were found ($p=0.016$) as well as a slower growth in net payments for inpatient expenditures resulting in \$76.84 in savings for this group ($p=0.042$). The comprehensive wellness program expenses totaled \$808,403 for four years with savings of \$1,335,524, averaging a cost of \$138.74 per employee and yielding a ROI of \$1.65 for every dollar invested into the program. The authors suggest that participation in a wellness program resulted in significant savings in healthcare costs compared with their non-participating counterparts, and even more compelling evidence of the program's value is the positive ROI associated with the wellness program.

Worksite Physical Activity Interventions

Most adults understand the importance of physical activity in maintaining a healthy lifestyle. However, effective physical activity interventions are needed to motivate sedentary individuals to initiate and maintain physical activity (Cress, 2006). The author examined the best practices for physical activity programs and behavior counseling in older adult populations. Some of the major factors shown to increase sustained habitual exercise were: self-efficacy,

social support, activity choices, health contracts, perceived safety, regular performance feedback, and positive reinforcement. These elements should be taken into account to create programs that increase physical activity levels among different populations including employees at a worksite.

Haines and colleagues (2007) attempted to promote walking and wellness among college faculty and staff by providing a 12-week walking program supplemented with a pedometer, a computer educational component, and weekly emails. The authors observed a decrease in body mass index (BMI), hypertension levels, and fasting glucose levels in 120 participants following the intervention. Also of importance was the increase in mean number of steps per week, which indicated a large increase in physical activity as compared to baseline levels. These findings demonstrated that health promotion programs that utilize various novel motivational tools, such as pedometers, can be beneficial to employee health.

Hallam and Petosa (2004) investigated the long-term impact of a four-session work-site intervention based on social cognitive theory (SCT) on exercise adherence in adults. The three variables related to SCT are; self-efficacy, outcome expectancy values, and self-regulation (i.e. social support, self-monitoring, relapse prevention, reinforcements, goal setting and time management). This study included 120 employees from an industry type company that self-selected to attend biweekly sessions to improve exercise adherence. The treatment group received four 60 minute sessions over a two week span, and the sessions were designed to increase SCT variables. The comparison group received an orientation to the fitness facility, instruction on use of equipment and a personal exercise program. The treatment group was able to maintain their exercise behavior while the comparison group decreased their exercise participation from 68% to 25% over 12 months. The authors suggest that self-regulation skills mediate exercise behavior, and the treatment group increased their use of self-regulation skills

and strategies. The intervention was designed to create a better understanding of maintaining a long term exercise routine and to prevent distorted outcome expectancy values to be formed.

A 12-week employee wellness program aimed at reducing cardiovascular risk factors was offered to university employees (White & Jacques, 2007). The participants included fifty university employees, twenty five of which completed pre and post-intervention measurements including weight, body composition, blood pressure, cholesterol, triglycerides, and blood sugar. The intervention consisted of choosing one of four physical activity recommendations based on baseline activity level, as well as making dietary changes and attending a minimum of four healthy lifestyle educational workshops in the 12 weeks. A primary barrier to exercise adherence was noted as being time constraints including less discretionary time for employees as the semester progressed. This study reported significant reductions in LDL cholesterol ($p=.002$), total cholesterol/HDL cholesterol ratio ($p=.015$), and weight ($p=.01$). There also was a significant ($p<.02$) correlation between participation in the diet component of the program and reduction in LDL cholesterol. This physical activity intervention was demonstrated as being successful in decreasing cardiovascular risk factors, despite the small sample size and low program completion rate. Addressing barriers associated with adherence may prove helpful in the implementation of future wellness programs. Overall, this type of program can be coordinated by occupational health nurses on site and should incorporate dietary guidelines, varying exercise prescriptions, demographic interests, and diverse workshops.

Chyou, Scheuer and Linneman (2006) evaluated the short term effect of a worksite based 20-week walking incentive program at Marshfield Clinic in a prospective observational study. Initial registration included 756 employees, but only 191 employees (26%), mostly female, completed the program and the online survey. The program was referred to as “Steps to a Better

You” and the four main points included: provision of a structured walking program based on baseline fitness level, providing incentive to meet minimum physical activity levels (5 or more days per week, for 30 to 60 minutes per day from the CDC), providing bi-weekly emails promoting program objectives, and reviewing participants’ comments and biometric measures to evaluate impact of web-based program. The Rockport Fitness Walking Test was self-administered and all data was self-reported, which limits the accuracy of results. In the pre-program assessment, 35% of participants had very low activity levels, and this improved to only 27.9% after program completion. Additionally, 91 women (48.9%) increased their level of physical activity by participating in the program. Of the women who completed post BMI measurements, 83.6% remained in the same categories, 9.6% decreased their BMI, and an overall significant ($p=.021$) decrease in mean BMI was observed. The primarily web-based intervention yielded relatively high levels of participant satisfaction. However, it was difficult to assess the effect of the program on unmotivated individuals because many opted not to complete the program or survey, leaving no data to analyze.

Exercise Adherence

The health benefits of regular physical activity are associated with lower incidence of chronic diseases (Chao, 2000). In fact, physical inactivity is considered a serious risk factor for coronary heart disease and it can worsen other health conditions such as osteoporosis, diabetes, depression, and obesity (Dubbart, 1992). Even though it is evident that a sedentary lifestyle can lower life expectancy and contribute to chronic disease, only 45% of adults report being active at recommended levels (at least thirty minutes a day, five times a week) during nonworking hours (Macera et al, 2005). Individuals are considered to be in a maintenance stage when the behavior is sustained for six months or longer (Blue & Conrad, 1995). It has been well documented that

approximately 50% of exercise participants drop out within the first six months of starting an exercise program (Chao, Capri, Foy, & Farmer, 2000; Blue & Conrad, 1995; Stoffelmayer et al, 1992), which presents a problem for health professionals and practitioners.

Heesch (2003) examined whether adherence to a lifestyle physical activity intervention predicted weekly participation in at least 150 minutes of moderate to vigorous physical activity. The participants were 244 sedentary adults. The experimental groups included a lifestyle group (Group G), a lifestyle correspondence group (Group C), and a control group. Group G subjects attended group meetings and received curriculum materials that focused on cognitive and behavioral strategies for increasing physical activity while Group C subjects received the same materials and spoke with a health educator once a month regarding their goals, physical activity level, and barriers to exercise. The control group received a 6-month membership to a YMCA. The results of this study suggest that those subjects with high levels of adherence to a specific protocol (in Group G or C) were more likely to meet the physical activity guideline (150 minutes a week) by the end of six months than those with low to moderate levels of adherence.

Robison et al. (1991) tested the effects of a six month incentive based exercise program on adherence and work capacity. The study sample included 137 staff and faculty participants from a university setting which was further divided into five different worksites. The use of behavioral management and incentive techniques were employed within the experimental group. The experimental group signed contracts to exercise four times a week and deposited forty dollars into an account which could be taken away with failure to meet contracted exercise goals. The control group participated in a similar program, but without the contracting or cash incentive strategies. Overall adherence for the experimental group was 97% as compared to 19% for the comparison group. The intervention resulted in a significant improvement in six-month exercise

adherence and an improved response to sub-maximal workload resulting in increased exercise tolerance and $\dot{V}O_2$ max. Behavioral strategies such as this one may prove more successful in enhancing exercise adherence due to the utilization of behavioral contracts, monetary incentives, social support, and team competition.

Elberson and colleagues conducted a retrospective study examining physiological variables between two groups in a Corporate Wellness Program. One group participated in structured exercise and the other in non-structured exercise (Elberson, Daniels & Miller, 2001). Subjects were recruited to participate in twelve consecutive months of either type of program. The physiological variables examined included body mass index, HDL cholesterol, total cholesterol/HDL ratio. At the end of the study, the non-structured group achieved significant ($p<.05$) changes in all variables. In contrast, the structured-exercise group increased mean HDL from 50.02 to 53.81 mg/dl and decreased mean total cholesterol to HDL ratio from 4.1 to 3.74. A limitation in this study was the lack of control of available data and the fact that actual exercise adherence was unknown.

In a quality improvement effort, the health status of personnel was examined before and after participation in an onsite fitness program (Bruges, Avigne & Wasik, 2006). The two groups consisted of perioperative nurses in a fitness group ($n=11$) and non-fitness participants ($n=9$) with a mean age of 45 and an average weight of 197 pounds. The physical activity intervention was led by an athletic trainer in the Physical Therapy department, and specifics on fitness regimen were not included. The SF-36 Health Survey Tool was used to measure several health related concepts including physical functioning, general health, vitality and bodily pain. By the end of one year, the participant group demonstrated lower cholesterol, glucose levels, and body fat. They also showed increased general health scores (73.6 to 79), physical function scores (91.2

to 93.5). In addition, the number of annual sick days in the fitness group totaled 30, compared with 54 sick days in the non-participant group.

Keele-Smith and Leon (2003) evaluated individually tailored interventions on exercise adherence to test the effects of a reversal theory-driven individualized exercise prescription. The study included 149 participants. They were divided into an education plus monitoring group or just a monitoring group. The education plus monitoring group received an exercise motivation questionnaire and an initial brochure that highlighted the benefits of exercise, recommendations for physical activity, potential barriers to exercise, and examples of strategies to increase adherence. They were also given a specific exercise prescription based on the results of their motivation questionnaire. The education plus monitoring group had significantly more consistent exercisers and fewer inconsistent exercisers than the group that received only monitoring.

Ortis et al. (2006) investigated the effect of behavioral and psychological techniques on increasing exercise levels. A total of 75 participants were randomly selected from a larger pool of adults who were in a “ready to change” state. Subjects answered two questionnaires; one related to motives for exercise participation and one related to barriers to exercise participation. All subjects received cognitive feedback on these questionnaires and the experimental group received weekly behavioral and physical advice. The experimental group increased or maintained their exercise, while the control group fell into a less likely to change state than before the intervention. The results of this study indicated that feedback on the participants motives for undertaking exercise combined with advice on improving physical condition resulted in facilitation of exercise adherence.

Researchers compared a lifestyle intervention to increase physical activity and a structured intervention over a two year period in a randomized trial (Dunn, Marcus, Kampert,

Garcia, Kohl, & Blair, 1999). Study participants (n=235) included sedentary individuals who received a 6 month intensive intervention followed by an 18 month maintenance intervention on either structured exercise or lifestyle physical activity. The model of Stages of Motivational Readiness (pre-contemplation, contemplation, preparation, action and maintenance) was used to increase cognitive and behavioral strategies in both groups. The structured group completed three weeks of supervised exercise and then received an individualized program consisting of a traditional exercise prescription with supervised sessions 5 days a week for 6 months at a state of the art fitness facility. The lifestyle group met weekly for 16 weeks, and then biweekly for 24 weeks. They were advised to get 30 minutes of moderate physical activity that fit with their lifestyle and used a problem solving approach to overcome barriers. Results at six months showed significantly higher levels of physical activity and cardiorespiratory fitness in both groups. After 24 months, the lifestyle intervention group increased moderate intensity exercise almost three times as much as the structured group ($p<.001$). The greater decline in fitness in the structured exercise group suggests that they were not able to maintain their physical activity levels as well as the lifestyle group. After 24 months, both interventions had similar energy expenditure and cardiorespiratory fitness, but the lifestyle intervention was more cost-effective.

Web Based Interventions

With the growing use of computers in the workplace and at home, the delivery of web-based interventions is showing promise for improving physical activity outcomes. In the previously mentioned study, Haines et al. (2007) attempted to promote walking and wellness among college faculty and staff by implementing a 12-week walking program supplemented with a pedometer, a web-based educational component, and weekly emails. The researchers observed a reduction in BMI, a decrease in hypertension levels, and a decrease in fasting glucose levels

after intervention. These findings demonstrate that health promotion programs that utilize web-based tools and emails can be beneficial to employee wellness.

Researchers conducted an observational study to assess the impact of a web-based intervention over a four year period in a large global workforce (Pratt, Janzio, Tomlinson, Kang & Smith, 2006). The 5-10-25 Challenge promoted the consumption of five or more fruits and vegetables per day, 10,000 steps per day, and weight management of a BMI of 25 or lower. A total of 2,498 subjects participated over four years and were recruited annually by email invitations. Once participants were enrolled, the web-based application allowed them to select a category for fruit and vegetable intake, number of steps walked, and bodyweight for each month. Results of the four year period indicated that there was a significant ($p < .05$) change in exercise behavior and fruit and vegetable intake. The decline in weight over the four year period was significantly ($p < .05$) correlated with increases in fruit and vegetable intake and exercise duration as measured by the number of steps taken. The web-based intervention worked well for employees who were interested in making behavioral changes to improve their lifestyle.

Napolitano and colleagues (2003) evaluated the use of a web-based intervention aimed to increase physical activity levels and stage of change in a randomized control study. The subjects included 65 individuals who spent 120 minutes or fewer in moderate physical activity or 60 minutes or less in vigorous physical activity. The web-based intervention was given to 30 subjects and 35 control subjects were put on a waiting list for the duration of the study. The intervention used on the website was based on social cognitive theory. It was targeted to specific stages of motivational readiness and addressed important issues such as safety, becoming active, overcoming barriers, planning activity, and benefits of physical activity. In addition, intervention subjects received weekly emails that were six sentences in length on topics such as getting

started, self-monitoring, goal setting, self-reward and gaining support. The primary measurements were Physical Activity Stage of Change and the Behavioral Risk Factor Surveillance System (BRFSS) which were completed at one month and three months following the study start date in both groups. The intervention group showed higher levels of walking minutes ($p < .001$) at the one month follow up. In addition the intervention group was more likely to progress in stage of motivational readiness than the control participants ($p < .01$). Web-based interventions have potential to reach large numbers of people and offer time flexibility, which may make it a potential resource to help change health behaviors with minimal resources.

Suminski and Petosa (2006) tested the efficacy of a web-based program which promoted the use of social cognitive theory (SCT) strategies for increasing physical activity. Subjects included college students enrolled in either a general health class (control group), or a fitness and exercise class (treatment group). The treatment group was required to complete one web assignment per week for nine weeks, which aimed to increase SCT variables of self-regulation, social support, and perceived confidence to overcome barriers to exercise whereas the comparison group received no such web based treatment. Students in the treatment group were required to review the previous week's web assignment and constantly modify their personal behavior plans. The SCT variables were measured using three different survey instruments following treatment and scores were analyzed within and between groups. The knowledge of web content was measured in the treatment group at the end of the study. The use of self-regulation strategies increased in the treatment group ($p < .001$) and their level of support from friends decreased ($p < .005$). There was a decrease in all SCT variables in the control group ($p < .05$) at the end of the study. Results showed that students in the treatment group learned skills for maintaining physical activity and were more likely to apply those strategies than

students not exposed to the web program. The authors concluded that the web can be a useful medium for delivering interventions aimed at increasing SCT variables and it has few utilization and administration problems.

Researchers examined the difference in self-reported physical activity between web and print mediated physical activity programs in a randomized trial (Marshall, Leslie, Bauman, Marcus, & Owen, 2003). Participants (n=655) received either a print version (n=328) of a booklet “Active Living” based on the transtheoretical model of behavioral change, or an interactive website version (n=327) of the same booklet which was also reinforced with personalized and stage based biweekly emails. The time spent in various intensities of physical activity was determined using a 7-day physical activity recall instrument and the International Physical Activity Questionnaire (IPAQ). Both groups increased their physical activity at 10 weeks, but there were no significant change within or between study groups. Study participants in both groups preferred to receive health related information via website and email. Only 11% of the print and 10% of the web group became sufficiently active, suggesting that these mediums alone are not sufficient to improve physical activity levels.

Regular performance feedback is a tool used to enhance exercise adherence. Performance feedback should be positive and meaningful to the individual (Cress et al., 2006). Annesi (1998) evaluated the effects of computer feedback on adherence to exercise. The participants were members from a large private fitness center (2700 members). The treatment group (n=93) used a specifically designed computer based system with advanced tracking, goal setting, and feedback. The equipment in the treatment group had a small computer screen that gave immediate feedback information and professional guidance. The control group (n=71) used standard exercise tracking and feedback. The authors concluded that the treatment group had greater adherence, yielding a

54% adherence rate after 8 months compared with the control which yielded only a 23% adherence rate. Also of importance was that 77% of the participants in the control group were dropouts, whereas only 46% of the treatment group dropped out. This intervention provided feedback directly within the exercise setting, which may contribute to its effectiveness in exercise adherence. Using computer technology to give feedback may provide treatments efficiently, accurately, and effectively.

Questionnaire & Submaximal VO₂ Test

In order to measure exercise adherence levels among adults, an instrument must be used that can accurately assess the minutes spent doing moderate to vigorous physical activity per week. The 7-day Physical Activity Recall (PAR) is an interviewer-administered instrument characterized as a standardized self-report measure of time spent in physical activity in various intensity categories, which occurred in 15 minute time periods (Hayden, Coleman, Sallis & Armstrong, 2003). Interviewers followed a specific script that inquired about the time of waking, all activities completed during the day that were moderate aerobic activity or higher and time of going to bed. Activity reports were then totaled into amount of minutes spent in sleep, moderate intensity (3-4.9 METS), hard intensity (5-5.9 METS) and very hard intensity (7.0 or more METS) (Hayden et al, 2003). In this study, time spent in light activity was derived by subtraction. In a study by Hayden and colleagues (2003), the telephone administered PAR was found to have a strong correlation with the in person PAR, with intraclass correlation coefficient of $r=0.96$. The PAR was also objectively validated with an accelerometer called the TriTrac-R3D, and correlations between phone PAR and TriTrac-R3D were $r=0.26$, $r=0.39$ and $r=0.78$ for moderate, hard and very hard intensities, respectively. It is difficult for participants to accurately assess moderate and hard physical activity, but very hard intensity is easiest to report. Results

demonstrated no significant difference in minutes spent in physical activity, nor the minutes in each intensity category between the phone PAR, the in-person PAR and the TriTrac-R3D (Hayden et al. 2003). The findings suggest that the phone PAR is comparable and as valid as the in-person PAR and can be used across various apparently healthy individuals whether they are active or sedentary to assess time spent in physical activity.

In a research study assessing validity of the PAR using the “gold standard” of doubly labeled water (DLW), Washburn (2003) and researchers found no significant differences between both instruments in total daily energy expenditure or physical activity energy expenditure. Subjects included 46 overweight, or obese, individuals who gave urine specimens following an overnight fast, then took an isotope dose with tap water and were told to return 4 to 6 hours later for another urine specimen. DLW analysis was conducted over a 14 day sample period using standard procedures. Though the PAR underestimated or overestimated physical activity expenditure in both men and women compared to the “gold standard”, there were not significant enough differences to prevent this tool from being reasonable for estimating energy expenditure. Constructs such as reliability and validity in the PAR were assessed among rural and urban adult men by Dubbert, Vander Weg, Kirchner & Shaw (2004). Reliability was tested by administering the test on weeks 2 and 4, and intraclass correlation coefficients in all participants ranged from $r=0.80$ to $r=0.90$ across all intensity categories. Validity was tested with the Tritrac R3D accelerometer average activity counts were significantly correlated with PAR energy expenditure ($p<.001$). These research studies suggest that the PAR is a reliable and valid instrument for estimating time spent in physical activity.

The six minute walk test (6MWT) has been tested for group validity and reproducibility in a study comparing lean and obese participants (Larsson & Reynisdottir, 2008). Subjects

included obese patients (n=43) who took the six minute walk test twice in one week compared with lean participants (n=41) who took it once. Validity tests showed a distance walked of 162 meters shorter in the obese group ($p<.001$) versus the lean group. In this study an increase of 80m between test and retest was needed to be clinically significant, but the obese group only improved about 25m ($p<.001$) showing reproducibility. The 6MWT can be used to analyze heart rate (Ending minus resting) and distance walked as outcomes for cardiovascular fitness in obese and healthy populations.

Summary

Worksite health promotion has crucial implications for cutting down on healthcare costs related to chronic lifestyle disease. Long term worksite wellness programs have demonstrated success in decreasing lifestyle related health costs, decreasing absenteeism and showing a positive return on investment. A key element of worksite health promotion is physical activity, which has potential to reduce risk for various costly lifestyle related diseases. Exercise interventions employing various strategies related to social cognitive theory variables have been utilized in the worksite to increase exercise adherence. In addition, novel interventions and interactive websites have been effective in increasing physical activity among adults. In developing an effective intervention, it is crucial to minimize time obligations and maximize personal efficacy in order to improve exercise adherence.

Lack of physical activity among employees is an important issue to address in worksite health promotion, and several studies have demonstrated that brief interventions can be effective in increasing exercise adherence in working adults. Habitual exercise behavior is a challenge to develop and several studies attempt to increase exercise adherence through various interventions. These intervention studies have shown promise by demonstrating the willingness of employees

to participate in wellness at work, but more measurable outcomes need to be demonstrated in order to evaluate effective outcomes. Creating a profile for individuals and prescribing exercise based on their stage of motivational readiness to change increases exercise adherence, but this specialized approach may not be cost effective.

More comprehensive and succinct approaches to increasing physical activity should be investigated. Structured and unstructured exercise (often referred to as lifestyle interventions) have implications for use in the workplace, and personal differences may influence exercise choices. To date, no previous studies have tested the effect of a bi-weekly educational workshop combined with a web-based exercise tracking system on objective outcomes related to physical fitness and exercise adherence.

Chapter III

Methods and Procedures

Introduction

This study examined the effect a bi-weekly workshop that included exercise education combined with a web based intervention on time spent in physical activity and cardiovascular fitness of staff and faculty members at Western Washington University. First, a recruitment email was sent to find participants that were sedentary university employees. Subjects were then randomly selected to be in the control or treatment group. All measurements were collected before and after intervention in both groups. After participants were informed of the requirements of the study and committed to the full duration, they were tested for BMI, waist to hip ratio, seven day PAR, Stage of Change and sub-maximal $\dot{V}O_2$ testing with the six minute walk test. This chapter first describes the population used in the research, and then describes in detail the procedures used for data collection and analysis.

Description of Population

Sixty self-selected university faculty and staff members were recruited for this study. Participants were healthy individuals between the ages of 25 and 65 who were not currently involved in regular exercise exceeding 60 minutes per week of moderate intensity, nor had they been involved in a structured exercise program for the last six months. Exclusion criteria were determined using the Physical Activity Readiness Questionnaire (PAR-Q) (Appendix A) from the American College of Sports Medicine, which screened participants for heart conditions that would require specialized attention. Participants were full time employees and contracted to attend all four exercise education sessions during their lunch hour over the eight-week study.

Design of the Study

The design of the study was a randomized group test. The treatment group consisted of 22 subjects who attended workshops and had access to a web portal for tracking physical activity. The web portal was designed by Healthforce Partners, a workplace health solution company based out of Bothell, Washington, that specializes in online tools for tracking healthy living. The version of the web portal used in this study allowed users to track physical activity duration in minutes and mode of exercise. The control group consisted of 11 subjects who received no such access to the web portal, but were informed of the recommended weekly physical activity levels via email one time. Both groups were required to complete a 7-day Physical Activity Recall (PAR) interview and Exercise Stage of Change survey (Appendix E) immediately prior to the study start date and when the study commenced after eight weeks. Both groups completed baseline and follow up physiological measurements including height, weight, waist circumference, and sub-maximal $\dot{V}O_2$.

Subjects randomly assigned to the Fitness Challenge treatment group, received bi-weekly workshops and access to a web portal for eight weeks. Additional instruction included a 15 minute orientation on how to use the web portal and a weekly email reminding them to track mode, duration and intensity of physical activity. The weekly email included physical activity recommendations stated by the Center for Disease Control and tips for scheduling physical activity, overcoming barriers and goal setting. The four bi-weekly exercise education workshops were about 40 minutes in duration and took place during the lunch hour. The format of the workshop is available in outline form (Appendix C) and topics included: starting a new exercise program, overcoming barriers to exercise, how to self-regulate using the ratings of perceived exertion (RPE) scale, different types of aerobic training and how to progress. Ten minutes of each

session was spent in goal setting and assessment of previous goals. Questions and answer sessions were kept to a minimum in an effort to decrease the effect of individual behavioral coaching, instead allowing the meetings to be addressed to the group. The information given on exercise related topics was meant to further educate the individuals about maintaining a regular aerobic exercise routine.

The comparison group received a calendar with physical activity options on campus and the Center for Disease Control's recommendation for aerobic exercise which is 150 minutes per week (CDC, 2011). No further instructions or contact was made until the eighth week of the study.

Data Collection Procedures

Instrumentation

An email (Appendix B) was sent to all WWU university staff and faculty members informing them about the study, and inviting their participation. They were instructed to respond via email if they were interested in participating in a study that gave them the opportunity to exercise and the initial guidance to do so. Additional recruitment was done by announcement to various departments. The 7-day Physical Activity Recall interview (Appendix D) was administered to all subjects either in person or by phone and subjects contracted to complete this within two days of the end of the study as a requirement for participation in this study.

Measurement Techniques and Procedures

The collection of baseline physical activity data for all subjects took place within a week prior to the study start date with the interview administered 7-day Physical Activity Recall. Weekly kilocalorie expenditure reported was converted into metabolic equivalents (MET) based on the time spent in low, moderate or high intensity activity throughout the day, 1 MET was

equivalent to rest. Graduate students from the exercise science department were recruited and trained as data collectors by the author of this study. They were instructed to follow uniform protocol provided by script that accompanies the 7-day Physical Activity Recall instrument. Interviewers followed the specific 7-day Physical Activity Recall script, documented daily activities and estimated the weekly METs of participants.

Prior to the intervention, the biometric measurements were taken for both groups. Height and weight were taken with a standard scale and stadiometer, and waist and hip measurements were taken at the narrowest circumference of the waist and at the widest circumference of the hips with a cloth tape measure. Both measurements were taken by the same person. Body Mass Index was then calculated as $\text{mass (kg)}/\text{height (m)}^2$ and Waist to Hip Ratio(WHR) was calculated as $\text{waist measurement (in)}/\text{hip measurement (in)}$.

The six minute walk test (6MWT) was performed as a submaximal $\dot{V}O_2$ measurement. The 6MWT data was gathered by trained graduate student volunteers using a Cardiosport heart rate monitor (Cardiosport, Waterlooville, Hampshire, United Kingdom), a stopwatch, a tape measure and cones set 10 m apart in a rectangular indoor track. Participants were instructed to “walk as far as possible for six minutes, but don’t run or jog”. The standardized encouragement was given every one minute by informing the participant of how many minutes were left. Heart rate (HR) before the test and directly following the 6MWT was recorded, as well as distance traveled in meters. The equation that calculates estimated $\dot{V}O_2$ is as follows: $\text{Peak } \dot{V}O_2 + \dot{V}O_2$ ml/kg/min = $[0.02 * \text{distance (m)}] - [0.191 * \text{age (yr)}] - [0.07 * \text{weight (kg)}] + [0.09 * \text{height (cm)}] + [0.26 * \text{RPP} (*10^{-3})] + 2.45$, m = distance in meters; yr= year; kg = kilograms; cm = centimeters, RPP= rate pressure product (HR * systolic blood pressure in mm Hg) (Cahalin et

al., 1996). A smaller ending heart rate (calculated by subtracting starting from ending) indicates improved fitness level.

The collection of data on the web based portal began immediately after the first workshop. The 7-day Physical Activity Recall interview was administered before intervention and at week eight after the intervention. Following the eight week intervention period, both groups had the same physiological measurements taken again. Completed questionnaires were analyzed and total kilocalorie expenditure was calculated for each week.

Statistical Analysis

The independent variables were the treatment: exposure to a unique intervention including biweekly workshops and a web-based exercise tracking system, and time: pre and post. The dependent variables were: the number of minutes spent in exercise and the total kilocalorie expenditure per week as indicated by the seven day Physical Activity Recall, the biometric measurements of BMI, waist to hip ratio, and 6MWT outcomes of ending heart rate minus starting heart rate and distance walked. Variables were analyzed with a mixed ANOVA with one repeated factor and one fixed factor, with significance of $p < 0.05$. Treatment group was the group that received the intervention, and Control group received no further interaction after pre-testing. The first level of time is the pre-test measurement outcomes and the second level is the post-test measurement outcomes.

Chapter IV

Results and Discussion

Introduction

This chapter presents the results of a web-based intervention on variables related to exercise adherence in sedentary university staff and faculty members after 8 weeks. Participants' motivational readiness to change results identifies if the intervention had an impact on their current mindset. Several biometric measurements were examined in order to investigate the degree of impact that the intervention had on variables related to exercise adherence.

Results

Subject Characteristics. The initial 40 participants (8 male, 32 female) were aged 48.98 ± 9.29 years and measured 1.66 ± 0.07 meters in height and weighed 82.95 ± 15.60 kilograms. Their average weekly physical activity level was 27.35 ± 15.47 METS. Seven subjects' (2 control and 5 treatment) data were not able to be used due to drop out, injury or inability to commit. Physical characteristics of groups were relatively similar and are presented in Table. 1.

Table 1

Physical Characteristics of Participants

Group		Age (yrs)	Height (m)	Weight (kg)	Activity ¹ (METs/week)
Total Population (N=40)	M SD	48.98 9.29	1.66 0.07	82.95 15.60	27.35 15.47
Treatment (N=27)	M SD	48.63 8.38	1.67 0.07	80.84 14.11	25.19 14.63
Control (N=13)	M SD	49.69 11.20	1.66 0.06	87.12 18.10	31.92 16.78

Note. ¹Activity (METs/week) describes amount of exercise performed in the week prior to the intervention.

Physiological Variables

Body Mass Index. The height and weight of all subjects was collected pre and post treatment in both groups, and their Body Mass Index (BMI) was calculated. All subjects had an initial BMI that was considered normal to overweight, according to the Center for Disease Control (CDC, 2012). The control subjects averaged $25.7 \pm 5.4 \text{ kg m}^{-2}$ and the treatment subjects averaged a BMI of $23.6 \pm 3.9 \text{ kg m}^{-2}$. After the 8-week intervention, control and treatment subjects displayed an average BMI of control $24.6 \pm 5.3 \text{ kg m}^{-2}$ and treatment $23.3 \pm 3.9 \text{ kg m}^{-2}$.

There was no significant difference in BMI between pre and post measurements across both groups ($F[1,31]=3.99$, $p=0.055$). There was no significant difference between the two groups ($F[1,30]=1.735$, $p=0.137$). There was no significant test by group interaction ($F[1,31]=0.843$, $p=0.366$).

Waist to Hip Ratio. All subjects had a relatively similar initial WHR, with the control group averaging 0.9 ± 0.1 and the treatment group averaging 0.86 ± 0.1 . After the 8 week intervention, the subjects displayed no significant change in WHR ($F[1,31]=0.007$, $p=0.933$). The control group had an average WHR of 0.87 ± 0.1 post intervention and the treatment group had an average WHR of 0.86 ± 0.1 following the eight week intervention.

There was no significant test by group interaction ($F[1,31]=0.007$, $p=0.933$). There was no significant difference in WHR between pre and post measurements across both groups ($F[1,31]=.139$, $p=0.712$). There was no significant difference between the two groups ($F[1,30]=0.133$, $p=0.718$).

Weight. The weight of all subjects was collected pre-treatment in both groups with the control group averaging $85.70 \pm 17.51 \text{ kg}$ and the treatment group averaging $79.70 \pm 14.56 \text{ kg}$.

Post intervention the control group had an average weight of 85.30 ± 17.28 kg, and the treatment group had an average weight of 78.56 ± 14.47 kg.

There was no significant test by group interaction ($F[1,31]=0.724$, $p=0.401$). There was no significant difference in weight between pre and post measurements across both groups ($F[1,31]=3.644$ $p=0.066$). There was no significant difference between the two groups ($F[1,30]=1.239$, $p=0.274$).

Six Minute Walk Test. The 6MWT was performed by all subjects and their starting and ending heart rate was collected pre and post treatment in both groups. All subjects at pre-testing had an ending heart rate that was relatively similar, with the control subjects mean heart rates measuring 75.4 ± 8.3 bpm and the treatment group averaging 75.7 ± 9.7 bpm. After the 8-week intervention, the treatment subjects displayed no significant change in ending heart rate. The control group's ending heart rate averaged 78.9 ± 11.1 bpm and the treatment group's ending heart rate measured 74.0 ± 11.0 bpm.

There was no significant test by group interaction ($F[1,31]=1.849$, $p=0.185$). There was no significant difference in ending HR between pre and post measurements across both groups ($F[1,31]=.210$ $p=0.651$). There was no significant difference between the two groups ($F[1,30]=.427$, $p=0.519$).

Total distance walked in six minutes was recorded prior to treatment in both groups. The control group walked an average of 590.7 ± 94.4 m and the treatment group walked an average of 621.3 ± 50.1 m. After the intervention, the control group walked 25 m more than they did at baseline, and the treatment group average distance was an additional 7 m. The control group walked an average of 615.6 ± 107.5 m post-intervention, while the treatment group walked an average distance of 628.9 ± 77.1 m post-intervention.

There was no significant test by group interaction ($F[1,31]=0.609$, $p=0.442$). There was no significant difference in distance walked between pre and post measurements across both groups ($F[1,31]=1.987$ $p=0.169$). There was no significant difference between the two groups ($F[1,30]=0.622$, $p=0.437$).

Exercise Adherence Variables

Self-Reported Weekly METs. All subjects were interviewed using the instrumentation of the Physical Activity Recall Survey, and reported their weekly time spent in exercise, which was then calculated into Metabolic Equivalents pre intervention. The control group reported a weekly average of 33.1 ± 15.7 METs and the treatment group reported a weekly average of 25.5 ± 15.8 METs. After the intervention, the average weekly reported METs in the control group were 23.4 ± 11.8 and the treatment group reported a weekly average of 21.7 ± 12.8 .

There was no significant test by group interaction ($F[1,31]=0.788$, $p=0.382$). There was no significant difference in weekly METs between pre and post measurements across both groups ($F[1,31]=3.954$ $p=0.056$). There was no significant difference between the two groups ($F[1,30]=1.344$, $p=0.256$).

Stage of Change. The subjects took a survey assessing their readiness to change into a maintenance level of exercise pre intervention, and the control group averaged 3.0 ± 0.1 while the treatment group averaged 3.4 ± 0.9 . According to the readiness to change scale, 1 in a pre-contemplation stage of change and 5 being in a maintenance stage of exercise, the treatment group started slightly closer to maintenance stage. The same survey was administered post intervention, and both groups moved up on the scale of readiness to change, the control group averaged 3.1 ± 0.1 and the treatment group averaged 3.8 ± 0.9 .

There was no significant test by group interaction ($F[1,31]=0.507$, $p=0.482$). There was no significant difference in Stage of Change between pre and post measurements across both groups ($F[1,31]=0.878$, $p=0.356$). However, there was a significant difference between the two groups ($F[1,30]=7.895$, $p=0.009$) indicating that the treatment may have moved subjects closer to adopting to a maintenance level of exercise.

Discussion

In this study, the efficacy of a unique web-based intervention on variables related to exercise adherence was examined in sedentary university staff and faculty who expressed interest in starting a new exercise program. Both the control and treatment groups completed baseline testing the week leading up to the intervention. The subjects in the control group were given the recommendations for healthy physical activity levels and were left to their own devices to engage in physical activity, without further support. The treatment group was given access to a Web Portal, designed by a local company who creates similar customized websites for use in corporate wellness settings, to track their physical activity on a daily basis. In addition, the treatment group attended a bi-weekly seminar which provided educational strategies related to increasing exercise. The null hypothesis stated that there would be no change in variables related to exercise adherence in the subjects that received a web-based intervention, versus those who did not. In an effort to disprove the null hypothesis, it was expected that the subjects who received the intervention would lose more weight, improve their fitness level, increase their time spent in exercise and improve their Stage of Change to a statistically significant level as compared with the control group who received no such intervention. This would imply that the web-based intervention is an effective way to increase employees' physical activity levels and is a cost-effective strategy for worksite health promotion.

The treatment group did not improve the biometric measures related to exercise adherence by lowering BMI, WHR or weight. Nor did their ending HR improve post 6MWT to a statistically significant level when compared with the control group, or when examined over time. Therefore, the treatment was essentially just as effective as giving basic guidelines for healthy physical activity levels. The only variable that reached statistical significance was the improved level of stage of change ($p<.05$) in the treatment group over time. However, there could have been a seasonal affect which influenced the outcome of this test. This only partially supported the hypothesis demonstrating that the web-based intervention can bring subjects closer to a maintenance stage of exercise. However, it could have been influenced by seasonal effect on initial values since data was collected during the winter holidays

There was no significant change in either group's weekly METs. Potential methodological limitations may explain why an interaction was not observed in weekly METs over time. When the subjects were interviewed initially, they were very detailed as to include all household chores as part of their kilocalorie expenditure. The subjects were slightly impatient during post testing and reported less detailed weekly MET recall. Additionally, the time of year may have affected the week of collected data as initial data collection was right after the holidays, a very physically busy time, and post data collection was two months later when there is not as much household activity.

Although many acknowledged researchers have demonstrated that web based interventions can be effective in increasing physical activity (Haines et al., 2007; Marshall et al., 2003; Napolitano et al., 2003; Pratt et al., 2006; Suminski and Petosa, 2006), a passive web tool may not be the most effective way to elicit change. This is demonstrated by the lack of statistical significance in physiological variables between control and intervention groups ($p<.05$).

Meaningful performance feedback (Cress et al., 2006) and more specific computer tools with advanced tracking, goal setting and professional feedback (Annesi 1998), have been found to enhance exercise adherence in adults and the intervention examined in this study design did not incorporate such elements. The Web Portal in this study isolated only the exercise tracking feature. The short duration of the study could have also contributed to the statistically insignificant physiological findings, as other interventions that are between 12 and 20 weeks in duration have been shown to be effective in increasing variables related to exercise adherence among sedentary adults (Chyou et al., 2006; Haines et al., 2007; Hallam & Petosa, 2004; White & Jacques, 2007).

The findings related to Stage of Change ($p=.009$) are consistent with other studies which demonstrate that incorporating a behavioral change workshop into the intervention can be effective in improving variables related to exercise adherence (Haines et al., 2007; Hallam and Petosa, 2004; Heesch, 2003; White & Jacques, 2007; Heesch, 2003). The subjects moved slightly closer to a maintenance level of exercise over time. However, the seasonal effect of being more ready to change in springtime, after the busy holiday season, could have affected the outcomes of this measure. Thus it is possible that the statistical significance reached is merely an artifact.

Robroek's (2012) recent study on a two year long internet delivered worksite health promotion programs among several different companies revealed that these programs were not cost effective due to the lack of long term engagement. The low change in physiological variables related to exercise adherence in this study show that a web based intervention may not be a cost effective investment in a worksite wellness program, especially if the web portal is used over a long period of time. Robroek's findings demonstrated low sustained participation and high attrition for this kind of internet delivered program (an average of three website visits in a two

year period), and suggested that other techniques such as individualized exercise programming should be used to attract higher risk individuals (Robroek et. al, 2012). The findings of the current study reveal that the web-based intervention can be classified as somewhat low impact at best.

Further support from Colkesen et al. (2011) demonstrated that a short 4 week web based intervention that used solely initial feedback from a Health Risk Assessment was effective in initiation of health behavior change. This suggests that brief and concise recommendations can be just as effective as long term complex interventions. The control group lost weight, improved their fitness, and increased their weekly METs with a simple email instructing them of the recommended levels of physical activity, which supports the notion that a brief and meaningful one time interaction can be just as effective as a longer term intervention.

The findings in this study support that Stage of Change can be positively affected by a workplace intervention, but other variables supported in the literature such as decreased BMI and improved resting heart rate were not affected. Heesch (2003) noted that participants who demonstrated adherence to a specific protocol, i.e. attending a workshop focused on goal setting or overcoming barriers to exercise, were more likely to meet the weekly recommended levels of exercise (150 minutes per week). Participants in this web based study had high adherence to attending the workshops, which should have resulted in their increased physical activity levels from baseline. However, the workshops may have not been individualized enough to affect change. Also, the lack of personalized feedback in the workshops may have negatively affected participants' ability to overcome barriers to exercise. Perhaps the web-based tracking tool was not a unique enough intervention to drastically impact the participant's fitness, since it gave minimal guidance on what type of exercise to do and lacked novelty.

Chapter V

Conclusions and Recommendations

Summary

Worksite health promotion programs have received notable attention from researchers as well as companies interested in lowering their overall spending on employee health insurance. Most research shows that implementing a wellness program can indeed have a positive return on investment (ROI) for companies and have a positive impact on the health of employees. Studies suggest that certain elements in an intervention are necessary for behavioral change such as: novelty, individualized feedback, behavioral change counseling and financial incentive (Annesi, 1998; Cress et al., 2006; Dunn, Marcus, Kampert, Garcia, Kohl, & Blair, 1999; Hallam and Petosa, 2004).

The current literature surrounding web based interventions addresses the efficacy of web delivered health promotion programs that are structured in nature and involve some other unique interpersonal component. However, little attention has been paid to exercise adherence due to web portal use with passive education.

The main purpose of this study was to examine how effective the web component of an exercise intervention is in improving exercise adherence. This is of interest since many companies invest significant funds into individualized web portals as part of their employee wellness program. No current studies isolated the web component to test its efficacy in behavioral change. The hypothesis of this study was that there would be an increase in exercise adherence among previously sedentary university employees who had access to a unique web portal for tracking exercise, as compared to a control group with no access. Furthermore, it was

hypothesized that subjects who received the treatment would also improve the biometric measures related to exercise adherence.

Ultimately, the question of whether web portals used for tracking physical activity are actually effective or if people are just ‘gaming’ the programs to receive incentive has not been completely addressed. Researchers have speculated on many different types of intervention protocols, but no current study isolates the efficacy of a web portal with only one function of tracking physical activity type, duration and frequency to date. Such a web-based intervention had no effects on the variables in this thesis. This could be valuable information for companies who invest money in these types of web tools as a part of their worksite wellness programming.

Conclusions

The data indicate that the web based intervention was just as effective as a one-time email recommendation for increasing physical activity, in changing physiological and behavior variables related to exercise adherence. In addition, the web portal component of the intervention was not found any more advantageous than having no such portal for recording type, duration and frequency of exercise. The results show that the only significant change over time was the Stage of Change ($p < 0.05$), and the biometric measures did not reach statistical significance.

Based on the findings of Robroek et al. (2012), long-term engagement in website portals used for tracking physical activity cannot be expected, therefore their impact on changing exercise adherence levels is low. However, the findings of Cress et al., (2006) and Annesi (1998), show that meaningful performance feedback can improve factors related to exercise adherence. Also Heesch (2003) demonstrated that interventions classified as ‘lifestyle’ approaches to increasing physical activity were typically more effective than ‘structured’ programs. With these points in mind, paired with the results of the current study, an effective

exercise intervention should be lifestyle related with minimal web participation requirements and maximal personal feedback. Employing health professionals, personal trainers and exercise professionals may be a better use of resources in worksite wellness programming.

Recommendations

Future directions for research may include assessing financial incentive combined with web portal use on exercise adherence and biometric variables in sedentary employees. In addition, future research focusing on effective and succinct behavioral change strategies for increasing exercise adherence would positively contribute to the literature.

It may be suggested that web portals used for tracking physical activity may not be the best use of resources for increasing exercise adherence in sedentary populations. However, use of educational workshops and other individualized interventions are more likely to improve Stage of Change over time. High risk individuals, who tend to be the most sedentary, are the most difficult to reach, and intensive lifestyle interventions should be employed to improve their variables related to exercise adherence.

Bibliography

- Astrup, S., McGovern, P. M., & Kochevar, L. K. (1992). The relationship between wellness participation and health care benefit utilization. *Benefits Quarterly*, 8(2), 41-54.
- Blue, C. L, & Conrad, K. M. (1995). Adherence to worksite exercise programs: an integrative review of recent research. *American Association of Occupational Health Nurses Journal*, 43(2), 76-86.
- Cahalin, L. P., Mathier, M. A., Semigran, M. J., et al. (1996). The six minute walk test predicts peak oxygen uptake and survival in patients with advanced heart failure. *Chest*, 110, 325-332.
- Chao, D., Capri, G., Foy, C. G., & Farmer, D. (2000). Exercise adherence among older adults: challenge and strategies. *Controlled Clinical Trials*, 21(5), 212S-217S.
- Center for Disease Control and Prevention (2011), Physical Inactivity Estimates By County. Retrieved from <http://www.cdc.gov/features/dsphysicalinactivity/>.
- Chyou, P., Scheuer, D, & Linneman, J. G. (2006). Assessment of female participation in an employee 20-week walking incentive program at Marshfield clinic, a large multispeciality group practice. *Clinical Medicine & Research*, 4(4), 256-265.
- Crenshaw, J. P. (2007). The motivational readiness to change leisure-time physical activity behavior of Mississippi community college students. Find Dissertation ID number
- Cress, M., Buchner, D., Prohaska, T., Rimmer, J., Brown, M., Macera, C., et al. (2006). Best practices for physical activity programs and behavior counseling in older adult populations. *European Review of Aging and Physical Activity*, 3, 34-42.

- Dubert, P. M., Vander Weg, M. W., Kirchner, K. A., & Shaw, B. (2004). Evaluation of the 7-day physical activity recall in urban and rural men. *Medicine & Science in Sports & Exercise*, 36(9), 1646-1654.
- Dubbert, P. (1992). Exercise in behavioral medicine. *Journal of Consulting and Clinical Psychology*, 60(4), 613-618.
- Dunn, A. L., Marcus, B. H., Kampert, J. B., et al. (1999). Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: a randomized trial. *Journal of American Medical Association*, 281(4), 327-334.
- Goetzel, R. Z., Jacobson, B. H., Aldana, S. G., Vardell, K., & Yee, L. (1998). Health care costs of worksite health promotion participants and non-participants, *Journal of Occupational and Environmental Medicine*, 40(4), 341-346.
- Haines, D. J., Davis, L., Rancour, P., Robinson, M., Neel-Wilson, T., & Wagner, S. (2007). A pilot intervention to promote walking and wellness and to improve the health of college faculty and staff. *Journal of American College Health*, 55(4), 219-225.
- Hallam, J. S., & Petosa, R. (2004). The long-term impact of a four-session work-site intervention on selected social cognitive theory variables linked to adult exercise adherence. *Health Education Behavior*, 31, 88-100.
- Hayden-Wade, H. A., Coleman, K. J., Sallis, J. F., & Armstrong, C. (2003). Validation of the telephone and in-person interview versions of the 7-day PAR. *Medicine and Science in Sports and Exercise*, 35(5), 801-809.
- Heesch, K. C., Masse, L. C., Dunn, A. L., Fankowski, R. F., & Mullen, P. D. (2003). Does adherence to a lifestyle physical activity intervention predict changes in physical activity? *Journal of Behavioral Medicine*, 2(4), 333-348.

- Kamininsky, L. A., Bonzheim, K. A., Garber, C. E., Glass, S. C., Hamm, L. F. et al. (Eds.). (2006). ACSM's resource manual for guidelines for exercise testing and prescription (5th ed.). Baltimore: Lippincott Williams & Wilkins.
- Keele-Smith, R., & Leon, T. (2003). Evaluation of individually tailored interventions on exercise adherence. *Western Journal of Nursing Research*, 25(6), 623-640.
- Larsson, U. E. & Reynisdottir, S. (2008). The six-minute walk test in outpatients with obesity: reproducibility and known group validity. *Physiotherapy Research International*, 13(2), 84-93.
- Macera, C. A., Ham, S. A., Yore, M. M, Jones, D. A., Ainsworth, B. E., Kimsey, C. D., et al. (2005). Prevalence of physical activity in the united states: Behavioral risk factor surveillance system, 2001. Preventing Chronic Disease 2005 April. Retrieved on October 12, 2007 from http://www.cdc.gov/pcd/issues/2005/apr/04_0114.htm.
- Marcus, B & L.Forsyth, 2003. In S. Blair (Ed.), *Motivating People to be Physically Active* (p. 21) Champaign, IL: Human Kinetics.
- Marshall, A. L., Leslie, E. R., Bauman, A. E., Marcus, B. H., Owen, N. (2003). Print versus website physical activity programs: a randomized trial. *American Journal of Preventative Medicine*, 25(2), 88-94.
- McMahan, S., Wells, M., Stokols, D., Philips, K., & Clitheroe, H. C. (2001). Assessing health promotion programming in small businesses. *American Journal of Health Studies*, 17(3), 120-128.

- Mokdad, A. H., Marks, J. S., Stroup, D. F., & Gerberding, J. L. (2004). Actual causes of death in the united states, 2000. *The Journal of the American Medical Association*, 291(10), 1238-1245.
- Napolitano, M. A., Fotheringham, M., Tate, D., Sciamanna, C., Leslie, E., Owen, N., et al. (2003). Evaluation of an internet-based physical activity intervention: a preliminary investigation. *Annals of Behavioral Medicine*, 25(2), 92-99.
- Naydeck, B. L., Pearson, J. A., Ozminkowski, R. J., Day, B. T., & Goetzel, R. Z. (2008). The impact of the highmark employee wellness programs on 4-year health care costs. *Journal of Occupational and Environmental Medicine*, 50, 146-156.
- Ortis, L. C., Maymi, J. N., Feliu, J. C., Vidal, J. M., Romero, E. P., Bassets, M. P., et al. (2007). Exercise motivation in university community members; a behavioural intervention. *Psicothema*, 19(2), 250-255.
- Pratt, D. S., Jandzio, M., Tomlinson, D., Kang, X, & Smith, E. (2006). The 5-10-25 Challenge: an observational study of a web-based wellness intervention for a global workforce. *Disease Management*, 9(5), 284-290.
- Robison, J. I., Rogers, M. A., Carlson, J. J., Mavis, B. E., Stachnik, T., Stoffelmayr, B., et al. (1991). Effects of a 6-month incentive-based exercise program on adherence and work capacity. *Medicine and Science in Sports and Exercise*, 24, 85-93.
- Robroek, S. J., Lindenboom, D. E., & Burdorf, A. (2012). Initial and Sustained Participation in an Internet-delivered Long-term Worksite Health Promotion Program on Physical Activity and Nutrition. *Journal of Medical Internet Research*, 14(2), 43-53.

- Robroek, S. J., Polinder, S., Bredt, F. J., & Burdof, A. (2012). Cost-effectiveness of a long-term Internet-delivered worksite health promotion programme on physical activity and nutrition: a cluster randomized controlled trial. *Oxford Journals*, 1-12.
- Stoffelmayr, B. E., Mavis B. E., Stachnik, T., Robison, J., Rogers, M., Vanhuss, W., et al. (1992). A program model to enhance adherence in work-site-based fitness programs. *Journal of Occupational Medicine*, 34(2), 156-161.
- Washburn, R. A., Jacobsen, D. J., Sonko, B. J., Hill, J. O., & Donnelly, J. E. (2003). The validity of the standard seven-day physical activity recall in young adults. *Medicine & Science in Sports & Exercise*, 35(8), 1374-1380.
- White, K. & Jacques, P. H. (2007). Combined diet and exercise intervention in the workplace, effect on cardiovascular disease risk factors. *American Association of Occupational Health Nurses*, 55(3), 109-114.

Appendix A

Physical Activity Readiness Questionnaire

Source: Physical Activity Readiness Questionnaire (PAR-Q). Copyright 2002. From Canadian Society for Exercise Physiology. <http://www.csep.ca/forms.asp>.

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
<input type="checkbox"/>	<input type="checkbox"/>	1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by a doctor?
<input type="checkbox"/>	<input type="checkbox"/>	2. Do you feel pain in your chest when you do physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	3. In the past month, have you had chest pain when you were not doing physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
<input type="checkbox"/>	<input type="checkbox"/>	5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
<input type="checkbox"/>	<input type="checkbox"/>	7. Do you know of <u>any other reason</u> why you should not do physical activity?

If
you
answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active — begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal — this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever — wait until you feel better; or
- if you are or may be pregnant — talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____

SIGNATURE OF PARENT
or GUARDIAN (for participants under the age of majority) _____

DATE _____

WITNESS _____

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.



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PAR-Q & YOU

Physical Activity Readiness
Questionnaire - PAR-Q
(revised 2002)

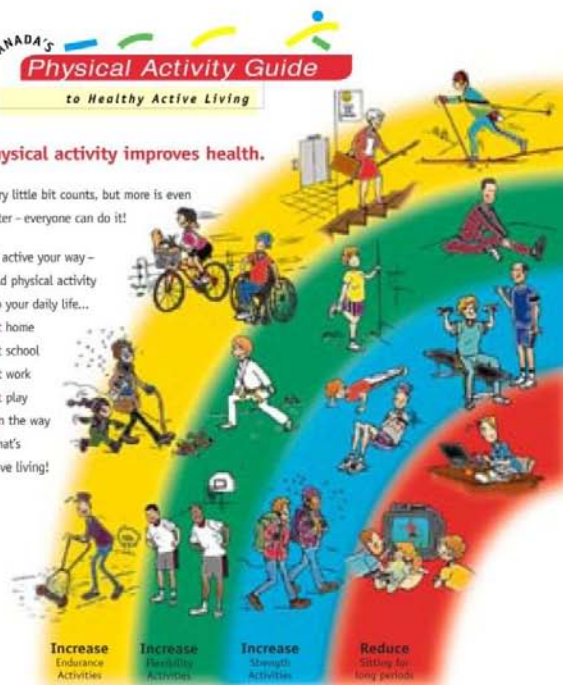


Physical activity improves health.

Every little bit counts, but more is even better – everyone can do it!

Get active your way – build physical activity into your daily life...

- at home
 - at school
 - at work
 - at play
 - on the way
- ...that's active living!



Increase
Endurance
Activities

Increase
Flexibility
Activities

Increase
Strength
Activities

Reduce
Sitting for
long periods

Choose a variety of activities from these three groups:

Endurance

4-7 days a week
Continuous activities for your heart, lungs and circulatory system.

Flexibility

4-7 days a week
Gentle reaching, bending and stretching activities to keep your muscles relaxed and joints mobile.

Strength

2-4 days a week
Activities against resistance to strengthen muscles and bones and improve posture.

Starting slowly is very safe for most people. Not sure? Consult your health professional.

For a copy of the Guide Handbook and more information: 1-888-334-9769, or www.paguide.com

Eating well is also important. Follow Canada's Food Guide to Healthy Eating to make wise food choices.

Get Active Your Way, Every Day – For Life!

Scientists say accumulate 60 minutes of physical activity every day to stay healthy or improve your health. As you progress to moderate activities you can cut down to 30 minutes, 4 days a week. Add-up your activities in periods of at least 10 minutes each. Start slowly... and build up.

Time needed depends on effort				
Very Light Effort	Light Effort	Moderate Effort	Vigorous Effort	Maximum Effort
60 minutes	30-60 minutes	20-30 minutes		
• Strolling	• Light walking	• Brisk walking	• Aerobics	• Sprinting
• Dusting	• Volleyball	• Biking	• Jogging	• Racing
	• Easy gardening	• Raking leaves	• Hockey	
	• Stretching	• Swimming	• Basketball	
		• Dancing	• Fast swimming	
		• Water aerobics	• Fast dancing	

Range needed to stay healthy

You Can Do It – Getting started is easier than you think

Physical activity doesn't have to be very hard. Build physical activities into your daily routine.

- Walk whenever you can – get off the bus early, use the stairs instead of the elevator.
- Reduce inactivity for long periods, like watching TV.
- Get up from the couch and stretch and bend for a few minutes every hour.
- Play actively with your kids.
- Choose to walk, wheel or cycle for short trips.
- Start with a 10 minute walk – gradually increase the time.
- Find out about walking and cycling paths nearby and use them.
- Observe a physical activity class to see if you want to try it.
- Try one class to start – you don't have to make a long-term commitment.
- Do the activities you are doing now, more often.

Benefits of regular activity:

- better health
- improved fitness
- better posture and balance
- better self-esteem
- weight control
- stronger muscles and bones
- feeling more energetic
- relaxation and reduced stress
- continued independent living in later life

Health risks of inactivity:

- premature death
- heart disease
- obesity
- high blood pressure
- adult-onset diabetes
- osteoporosis
- stroke
- depression
- colon cancer



Source: Canada's Physical Activity Guide to Healthy Active Living, Health Canada, 1998 <http://www.hc-sc.gc.ca/hppb/paguide/pdf/guideEng.pdf>

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FITNESS AND HEALTH PROFESSIONALS MAY BE INTERESTED IN THE INFORMATION BELOW:

The following companion forms are available for doctors' use by contacting the Canadian Society for Exercise Physiology (address below):

The **Physical Activity Readiness Medical Examination (PARmed-X)** – to be used by doctors with people who answer YES to one or more questions on the PAR-Q.

The **Physical Activity Readiness Medical Examination for Pregnancy (PARmed-X for Pregnancy)** – to be used by doctors with pregnant patients who wish to become more active.

References:

- Arraix, G.A., Wigle, D.T., Mao, Y. (1992). Risk Assessment of Physical Activity and Physical Fitness in the Canada Health Survey Follow-Up Study. *J. Clin. Epidemiol.* 45:4 419-428.
- Mottola, M., Wolfe, L.A. (1994). Active Living and Pregnancy. In: A. Quinney, L. Gauvin, T. Wall (eds.), **Toward Active Living: Proceedings of the International Conference on Physical Activity, Fitness and Health**. Champaign, IL: Human Kinetics.
- PAR-Q Validation Report, British Columbia Ministry of Health, 1978.
- Thomas, S., Reading, J., Shephard, R.J. (1992). Revision of the Physical Activity Readiness Questionnaire (PAR-Q). *Can. J. Spt. Sci.* 17:4 338-345.

For more information, please contact the:

Canadian Society for Exercise Physiology
202-185 Somerset Street West
Ottawa, ON K2P 0J2
Tel. 1-877-651-3755 • FAX (613) 234-3565
Online: www.csep.ca

The original PAR-Q was developed by the British Columbia Ministry of Health. It has been revised by an Expert Advisory Committee of the Canadian Society for Exercise Physiology chaired by Dr. N. Gledhill (2002).

Disponible en français sous le titre «Questionnaire sur l'aptitude à l'activité physique - Q-AAP (révisé 2002)».



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Appendix B

Recruitment Email

Calling all staff and faculty members who are interested in being part of an eight week study on worksite interventions for improving exercise adherence. If you would like some guidance on starting a new exercise program, or know someone at Western who would, please email huntins@cc.wvu.edu with name and email address for a consent form and health screening form.

You are eligible for this study if:

- You have not been involved in a structured exercise program in the last 6 months*
- You have no health complications preventing you from starting an exercise program*
- You currently do not get more than 60 minutes of exercise per week*
- You are a full or part time employee at WWU*
- You are between the age of 25 and 60*

Advantages:

You will get guidance on how to start an exercise program

You will get FREE access to a web portal to track your exercise

The only time commitment is 4 lunch hour workshop sessions (over 8 weeks)

You will receive pre and post fitness tests three times

**note: fitness test is a sub-maximal walking test, NOT a maximal test*

Thank you for your time and consideration for this study.

Appendix C

Outline for Exercise Workshop Topics

Week 1

Slide Show (Slides from WELCOA, Getting Active: Changing Health Behaviors for the Better)

I. Why be active?

- a. What are your Pros- Reasons for being active, Cons- reasons for not being active
- b. Benefits associated with PA
- c. Increase your pros and decrease your cons
- d. How much physical activity is needed to maintain health?
- e. How much physical activity is needed to lose weight?

II. Ways to Overcome Barriers to Exercise?

- a. Brainstorm ways to make exercise more convenient
- b. Ways to be more active at home
- c. Ways to be more active at work

III. Types of Exercise I record on my Fitness Challenge portal

- a. What are aerobic activities?
- b. What types do I like? Indoor, outdoor, structured, non-structured, group, alone, machine, no machine. Encourage trying out different types this week to find likes/dislikes.
- c. How to gauge my exertion using talk test
- d. Moderate, vigorous and very hard exercise

IV. Elements of an Aerobic Exercise Session

- a. Warm up, aerobic activity, cool down
- b. When to stop

- c. FIT principles: Frequency Intensity and Duration

V. Goal setting for Physical Activity

- a. Make your goals specific (i.e. what activity)
- b. Make your goals measurable (i.e. minutes or days spent in PA)
- c. Make your goals achievable

Week 2

Slideshow (Select Slides from WELCOA, Chapter 9 What Exercise Will Do For You and Physical Activity Nuts and Bolts)

I. Instruction on Developing a physical activity plan that progresses

- a. Getting a variety of types of physical activity
- b. When to add more physical activity
- c. How to build exercise tolerance using intervals

II. Self-Monitoring Techniques

- a. RPE scale
- b. Tracking exercise behavior

III. Importance of Stretching

- a. Common lower extremity stretches
- b. How long to stretch
- c. How far to stretch

IV. Planning for Setbacks

- a. Anticipate what may prevent physical activity
- b. Come up with plan for setbacks

- c. Find an accountability partner (spouse, coworker) have them check in with you

VI. Goal setting for Physical Activity

- a. What activities did you like?
- b. Reassess Goals from Last Week (If goals are met, build on them. If not met, set more achievable goals)
- c. Make your goals specific (i.e. what activity)
- d. Make your goals measurable (i.e. minutes or days spent in PA)
- e. Make your goals achievable

Week III

Slideshow (select slides from WELCOA Chapter 10 Gaining Support and Goal Setting)

I. Gaining Support (Social Support)

- a. Participation in exercise with another person
- b. Asking a spouse or significant person to support your physical activity

II. Mentoring Others (Building Confidence)

- a. Using your knowledge about overcoming barriers
- b. Talk about how you made progress in your exercise program

III. Desired Outcomes

- a. Weight Loss
- b. Reduced risk of heart disease
- c. More energy
- d. Complete ADLs

IV. Reaching a Plateau

- a. Finished general conditioning stage
 - b. How can you keep progressing
 - c. Overcoming stagnant routines and staying at the right intensity
 - d. Monitoring your workout
- V. Engaging the Core in your physical activity
- a. How to compress the abdominal wall
 - b. Maintaining good posture during activity
 - c. Carrying good posture throughout the day
- VI. Revisit Previous Goals & Set New Goals
- a. Were goals met?
 - b. What are my desired outcomes?
 - c. Based on my desired outcomes, is my PA program adequate for reaching those outcomes?
 - d. Readjust goals based on desired outcomes
 - i. Specific
 - ii. Measurable
 - iii. Achievable

Week 4 Slideshow (select slides from WELCOA Chapter 11 Being Physically Active for Life)

- I. Maintaining a Physically Active Lifestyle
 - a. Strategies for long term Physical Activity
 - b. What would cause me to drop out? How can I overcome this?
- II. Importance of Recording Physical Activity
 - a. Allows you to see your patterns with exercise behavior

- b. When exercise behavior decreases, try and find out why it did.
- c. Be proactive with your approach to physical activity

III. Daily Reminders

- a. Schedule in your Physical Activity into your week early on (Outlook)
- b. Leave comfortable shoes in car or at desk at work
- c. Have your accountability partner check in with you often

IV. Review Last week's Physical Activity Goals

- a. Did I meet my goals
- b. Set new short and long term goals

Appendix D

Permission Granted to use 7 Day Physical Activity Recall Questionnaire via email below:

Summer:

Yes, you have permission to use the Stanford 7-day Physical Activity Recall questionnaire for your research.
Keep us posted on the results.
Bill Haskell

Quoting Jeff Myll <jmyll@stanford.edu>:

> Bill,
> This request went to SHN webmaster.
>
> Jeff
>
>
>
> Begin forwarded message:
>
>> From: Summer Huntington <huntins@cc.wvu.edu>
>> Date: October 22, 2008 1:40:15 PM PDT
>> To: webmaster@stanfordheart.net
>> Subject: Permission to Use 7 day PAR for research
>>
>> Dear Dr. Bill Haskell,
>>
>> My name is Summer Huntington, graduate student at Western Washington
>> University. I would like to request permission to use the 7 day Physical
>> Activity Recall Questionnaire for research purposes. If granted
>> permission, this will used as an instrument to measure physical activity
>> levels pre and post exercise intervention in previously sedentary
>> individuals. If you need more details about my study, I would be happy to
>> provide them. Please send a short email with or without your permission.
>> If you need a mailing address, I can provide that as well.
>>
>> Thank you for your time and consideration.
>>
>> In Health,
>>
>> Summer Huntington
>
> Jeff Myll
> Stanford Prevention Research Center
> Stanford University School of Medicine
> 211 Quarry Road
> Stanford, CA 94305-5705
> 650-725-5315
> jmyll@stanford.edu
>
> CONFIDENTIALITY NOTICE: Information contained in this message and any
> attachments are intended only for the addressee(s). If you believe
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> immediately by return electronic mail, and please delete it without
> further review, disclosure, or copying

7-Day Physical Activity Recall (Sallis et al.)

7-Day Physical Activity Recall

SSN

PAR#: 1 2 3 4 5 6 7

Participant

Interviewer

Today is

Today's Date

1. Were you employed in the last seven days?

0. No (Skip to Q#4) 1. Yes

2. How many days of the last seven did you work?

____ days

3. How many total hours did you work in the last seven days?

____ hours last week

4. What two days do you consider your weekend days?

(mark days below with a squiggle)

WORKSHEET

DAYS

SLEEP		1	2	3	4	5	6	7
M O R N I N G	Moderate							
	Hard							
	Very Hard							
A F T E R N O O N	Moderate							
	Hard							
	Very Hard							
E V E N I N G	Moderate							
	Hard							
	Very Hard							
Total Min Per Day	Strength:							
	Flexibility:							

4a. Compared to your physical activity over the past 3 months, was last week's physical activity more, less, or about the same?		6. Do you think this was a valid PAR Interview?	
1. More	2. Less	3. About the same	0. No If NO, go to the back and explain.
5. Were there any problems with the PAR interview?			7. Were there any special circumstances concerning this PAR ?
0. No			1. Yes, If YES, what were they?(circle)
1. Yes If YES, go to the back and explain.			1. Injury all week 2. Illness all week 3. Illness part week 4. Injury part week 5. Pregnancy 6. Other:

7-Day Physical Activity Recall

SSN _____

Worksheet Key:

An asterisk (*) denotes a work-related activity.

A squiggly line through a column (day) denotes a weekend day.

Rounding: 10-22 min.=.25

23-37 min.=.50

38-52 min.=.75

53-1:07 hr/min. =1.0

1:08-1:22 hr/min.=1.25

5. Explain why there were problems with this PAR interview:

6. If PAR interview was not valid, why was it not valid?

7. Please list below any activities reported by the subject which you do not know how to classify.

8. Please provide any other comments you may have.

Appendix E

Exercise: Stages of Change – Continuous Measure

Please use the following definition of exercise when answering these questions:

Regular Exercise is any planned physical activity (e.g., brisk walking, aerobics, jogging, bicycling, swimming, rowing, etc.) performed to increase physical fitness. Such activity should be performed 3 to 5 times per week for 20-60 minutes per session. Exercise does not have to be painful to be effective but should be done at a level that increases your breathing rate and causes you to break a sweat.

Please enter the number in the box that indicates how strongly you agree or disagree with the following statements.

1 = Strongly Disagree

2 = Disagree

3 = Undecided

4 = Agree

5 = Strongly Agree

1.	As far as I'm concerned, I don't need to exercise regularly.	<input type="checkbox"/>
2.	I have been exercising regularly for a long time and I plan to continue.	<input type="checkbox"/>
3.	I don't exercise and right now I don't care.	<input type="checkbox"/>
4.	I am finally exercising regularly.	<input type="checkbox"/>
5.	I have been successful at exercising regularly and I plan to continue.	<input type="checkbox"/>
6.	I am satisfied with being a sedentary person.	<input type="checkbox"/>
7.	I have been thinking that I might want to start exercising regularly.	<input type="checkbox"/>
8.	I have started exercising regularly within the last 6 months.	<input type="checkbox"/>
9.	I could exercise regularly, but I don't plan to.	<input type="checkbox"/>
10.	Recently, I have started to exercise regularly.	<input type="checkbox"/>
11.	I don't have the time or energy to exercise regularly right now.	<input type="checkbox"/>
12.	I have started to exercise regularly, and I plan to continue.	<input type="checkbox"/>
13.	I have been thinking about whether I will be able to exercise regularly.	<input type="checkbox"/>
14.	I have set up a day and a time to start exercising regularly within the next few weeks.	<input type="checkbox"/>
15.	I have managed to keep exercising regularly through the last 6 months.	<input type="checkbox"/>
16.	I have been thinking that I may want to begin exercising regularly.	<input type="checkbox"/>
17.	I have lined up with a friend to start exercising regularly within the next few weeks.	<input type="checkbox"/>

18.	I have completed 6 months of regular exercise.	<input type="checkbox"/>
19.	I know that regular exercise is worthwhile, but I don't have time for it in the near future.	<input type="checkbox"/>
20.	I have been calling friends to find someone to start exercising with in the next few weeks.	<input type="checkbox"/>
21.	I think regular exercise is good, but I can't figure it into my schedule right now.	<input type="checkbox"/>
22.	I really think I should work on getting started with a regular exercise program in the next 6 months.	<input type="checkbox"/>
23.	I am preparing to start a regular exercise group in the next few weeks.	<input type="checkbox"/>
24.	I am aware of the importance of regular exercise but I can't do it right now.	<input type="checkbox"/>

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Marcus, B.H., Selby, V.C., Niaura, R.S., & Rossi, J.S. (1992). Self-efficacy and the stages of exercise behavior change. Research Quarterly for Exercise and Sport, 63, 60-66.

Reed, G.R. (1994). Measuring stage of change for exercise behavior change, URICA-E2. Unpublished Dissertation.

Appendix F

6 Minute Walk Test

Instructions:

Please instruct the subject to “walk as far as possible and as fast as possible for 6 minutes without running.” Only provide them with standardized encouragement once every minute, “you have X minutes remaining.” Substitute X for the actual number of minutes remaining.

Please walk about 10 meters behind the participant on the inside of the track to assure minimal influence in their gait.

Data Collected:

Subject Number: _____

Resting Heart Rate: _____ bpm

Ending Heart Rate: _____ bpm

Total Distance Walked: _____ meters

Appendix G

All Subject's Data

Table 1: BMI

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	.852	1	.852	3.991	.055	.114	3.991	.490
	Greenhouse- Geisser	.852	1.000	.852	3.991	.055	.114	3.991	.490
	Huynh-Feldt	.852	1.000	.852	3.991	.055	.114	3.991	.490
	Lower-bound	.852	1.000	.852	3.991	.055	.114	3.991	.490
test * GROUP	Sphericity Assumed	.180	1	.180	.843	.366	.026	.843	.144
	Greenhouse- Geisser	.180	1.000	.180	.843	.366	.026	.843	.144
	Huynh-Feldt	.180	1.000	.180	.843	.366	.026	.843	.144
	Lower-bound	.180	1.000	.180	.843	.366	.026	.843	.144
Error(test)	Sphericity Assumed	6.616	31	.213					
	Greenhouse- Geisser	6.616	31.000	.213					
	Huynh-Feldt	6.616	31.000	.213					
	Lower-bound	6.616	31.000	.213					

a. Computed using alpha = .05

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	35289.942	1	35289.942	886.935	.000	.966	886.935	1.000
GROUP	69.022	1	69.022	1.735	.197	.053	1.735	.248
Error	1233.447	31	39.789					
a. Computed using alpha = .05								

Table 2: Waist Measurement

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	.992	1	.992	.240	.628	.008	.240	.076
	Greenhouse- Geisser	.992	1.000	.992	.240	.628	.008	.240	.076
	Huynh-Feldt	.992	1.000	.992	.240	.628	.008	.240	.076
	Lower-bound	.992	1.000	.992	.240	.628	.008	.240	.076
test * GROUP	Sphericity Assumed	3.886	1	3.886	.940	.340	.030	.940	.155
	Greenhouse- Geisser	3.886	1.000	3.886	.940	.340	.030	.940	.155
	Huynh-Feldt	3.886	1.000	3.886	.940	.340	.030	.940	.155
	Lower-bound	3.886	1.000	3.886	.940	.340	.030	.940	.155
Error(test)	Sphericity Assumed	123.972	30	4.132					
	Greenhouse- Geisser	123.972	30.000	4.132					
	Huynh-Feldt	123.972	30.000	4.132					
	Lower-bound	123.972	30.000	4.132					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	83997.226	1	83997.226	1397.887	.000	.979	1397.887	1.000
GROUP	80.186	1	80.186	1.334	.257	.043	1.334	.201
Error	1802.662	30	60.089					
a. Computed using alpha = .05								

Table 3: Hip Measurement

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	4.203	1	4.203	3.478	.073	.110	3.478	.437
	Greenhouse- Geisser	4.203	1.000	4.203	3.478	.073	.110	3.478	.437
	Huynh-Feldt	4.203	1.000	4.203	3.478	.073	.110	3.478	.437
	Lower-bound	4.203	1.000	4.203	3.478	.073	.110	3.478	.437
test * GROUP	Sphericity Assumed	2.091	1	2.091	1.730	.199	.058	1.730	.246
	Greenhouse- Geisser	2.091	1.000	2.091	1.730	.199	.058	1.730	.246
	Huynh-Feldt	2.091	1.000	2.091	1.730	.199	.058	1.730	.246
	Lower-bound	2.091	1.000	2.091	1.730	.199	.058	1.730	.246
Error(test)	Sphericity Assumed	33.841	28	1.209					
	Greenhouse- Geisser	33.841	28.000	1.209					
	Huynh-Feldt	33.841	28.000	1.209					
	Lower-bound	33.841	28.000	1.209					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	106520.621	1	106520.621	1735.933	.000	.984	1735.933	1.000
GROUP	160.913	1	160.913	2.622	.117	.086	2.622	.346
Error	1718.141	28	61.362					
a. Computed using alpha = .05								

Table 4: Waist to Hip Ratio

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	.000	1	.000	.139	.712	.005	.139	.065
	Greenhouse- Geisser	.000	1.000	.000	.139	.712	.005	.139	.065
	Huynh-Feldt	.000	1.000	.000	.139	.712	.005	.139	.065
	Lower-bound	.000	1.000	.000	.139	.712	.005	.139	.065
test * GROUP	Sphericity Assumed	1.367E-5	1	1.367E-5	.007	.933	.000	.007	.051
	Greenhouse- Geisser	1.367E-5	1.000	1.367E-5	.007	.933	.000	.007	.051
	Huynh-Feldt	1.367E-5	1.000	1.367E-5	.007	.933	.000	.007	.051
	Lower-bound	1.367E-5	1.000	1.367E-5	.007	.933	.000	.007	.051
Error(test)	Sphericity Assumed	.052	28	.002					
	Greenhouse- Geisser	.052	28.000	.002					
	Huynh-Feldt	.052	28.000	.002					
	Lower-bound	.052	28.000	.002					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	39.597	1	39.597	3621.210	.000	.992	3621.210	1.000
GROUP	.001	1	.001	.133	.718	.005	.133	.064
Error	.306	28	.011					
a. Computed using alpha = .05								

Table 5: Weight

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	8.993	1	8.993	3.644	.066	.105	3.644	.456
	Greenhouse- Geisser	8.993	1.000	8.993	3.644	.066	.105	3.644	.456
	Huynh-Feldt	8.993	1.000	8.993	3.644	.066	.105	3.644	.456
	Lower-bound	8.993	1.000	8.993	3.644	.066	.105	3.644	.456
test * GROUP	Sphericity Assumed	1.788	1	1.788	.724	.401	.023	.724	.131
	Greenhouse- Geisser	1.788	1.000	1.788	.724	.401	.023	.724	.131
	Huynh-Feldt	1.788	1.000	1.788	.724	.401	.023	.724	.131
	Lower-bound	1.788	1.000	1.788	.724	.401	.023	.724	.131
Error(test)	Sphericity Assumed	76.518	31	2.468					
	Greenhouse- Geisser	76.518	31.000	2.468					
	Huynh-Feldt	76.518	31.000	2.468					
	Lower-bound	76.518	31.000	2.468					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	397442.166	1	397442.166	831.071	.000	.964	831.071	1.000
GROUP	592.398	1	592.398	1.239	.274	.038	1.239	.190
Error	14825.099	31	478.229					
a. Computed using alpha = .05								

Table 6: Ending Heart Rate

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	10.184	1	10.184	.210	.651	.008	.210	.073
	Greenhouse- Geisser	10.184	1.000	10.184	.210	.651	.008	.210	.073
	Huynh-Feldt	10.184	1.000	10.184	.210	.651	.008	.210	.073
	Lower-bound	10.184	1.000	10.184	.210	.651	.008	.210	.073
test * GROUP	Sphericity Assumed	89.839	1	89.839	1.849	.185	.064	1.849	.259
	Greenhouse- Geisser	89.839	1.000	89.839	1.849	.185	.064	1.849	.259
	Huynh-Feldt	89.839	1.000	89.839	1.849	.185	.064	1.849	.259
	Lower-bound	89.839	1.000	89.839	1.849	.185	.064	1.849	.259
Error(test)	Sphericity Assumed	1312.092	27	48.596					
	Greenhouse- Geisser	1312.092	27.000	48.596					
	Huynh-Feldt	1312.092	27.000	48.596					
	Lower-bound	1312.092	27.000	48.596					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	302815.453	1	302815.453	1897.476	.000	.986	1897.476	1.000
GROUP	68.211	1	68.211	.427	.519	.016	.427	.097
Error	4308.892	27	159.589					
a. Computed using alpha = .05								

Table 7: Weekly METs

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	665.170	1	665.170	3.954	.056	.116	3.954	.486
	Greenhouse- Geisser	665.170	1.000	665.170	3.954	.056	.116	3.954	.486
	Huynh-Feldt	665.170	1.000	665.170	3.954	.056	.116	3.954	.486
	Lower-bound	665.170	1.000	665.170	3.954	.056	.116	3.954	.486
test * GROUP	Sphericity Assumed	132.595	1	132.595	.788	.382	.026	.788	.138
	Greenhouse- Geisser	132.595	1.000	132.595	.788	.382	.026	.788	.138
	Huynh-Feldt	132.595	1.000	132.595	.788	.382	.026	.788	.138
	Lower-bound	132.595	1.000	132.595	.788	.382	.026	.788	.138
Error(test)	Sphericity Assumed	5046.604	30	168.220					
	Greenhouse- Geisser	5046.604	30.000	168.220					
	Huynh-Feldt	5046.604	30.000	168.220					
	Lower-bound	5046.604	30.000	168.220					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	38844.568	1	38844.568	165.407	.000	.846	165.407	1.000
GROUP	315.555	1	315.555	1.344	.256	.043	1.344	.202
Error	7045.268	30	234.842					
a. Computed using alpha = .05								

Table 8: Stage of Change

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	.518	1	.518	.878	.356	.028	.878	.148
	Greenhouse- Geisser	.518	1.000	.518	.878	.356	.028	.878	.148
	Huynh-Feldt	.518	1.000	.518	.878	.356	.028	.878	.148
	Lower-bound	.518	1.000	.518	.878	.356	.028	.878	.148
test * GROUP	Sphericity Assumed	.299	1	.299	.507	.482	.017	.507	.106
	Greenhouse- Geisser	.299	1.000	.299	.507	.482	.017	.507	.106
	Huynh-Feldt	.299	1.000	.299	.507	.482	.017	.507	.106
	Lower-bound	.299	1.000	.299	.507	.482	.017	.507	.106
Error(test)	Sphericity Assumed	17.697	30	.590					
	Greenhouse- Geisser	17.697	30.000	.590					
	Huynh-Feldt	17.697	30.000	.590					
	Lower-bound	17.697	30.000	.590					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	632.326	1	632.326	1054.891	.000	.972	1054.891	1.000
GROUP	4.732	1	4.732	7.895	.009	.208	7.895	.776
Error	17.983	30	.599					
a. Computed using alpha = .05								

Table 9: Distance Walked

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	3636.904	1	3636.904	1.987	.169	.064	1.987	.276
	Greenhouse- Geisser	3636.904	1.000	3636.904	1.987	.169	.064	1.987	.276
	Huynh-Feldt	3636.904	1.000	3636.904	1.987	.169	.064	1.987	.276
	Lower-bound	3636.904	1.000	3636.904	1.987	.169	.064	1.987	.276
test * GROUP	Sphericity Assumed	1114.159	1	1114.159	.609	.442	.021	.609	.117
	Greenhouse- Geisser	1114.159	1.000	1114.159	.609	.442	.021	.609	.117
	Huynh-Feldt	1114.159	1.000	1114.159	.609	.442	.021	.609	.117
	Lower-bound	1114.159	1.000	1114.159	.609	.442	.021	.609	.117
Error(test)	Sphericity Assumed	53077.157	29	1830.247					
	Greenhouse- Geisser	53077.157	29.000	1830.247					
	Huynh-Feldt	53077.157	29.000	1830.247					
	Lower-bound	53077.157	29.000	1830.247					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	2.140E7	1	2.140E7	1987.741	.000	.986	1987.741	1.000
GROUP	6697.033	1	6697.033	.622	.437	.021	.622	.119
Error	312283.466	29	10768.395					
a. Computed using alpha = .05								

Table 10: Submaximal Heart Rate Reserve

Tests of Within-Subjects Effects									
Measure: MEASURE_1									
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
test	Sphericity Assumed	.556	1	.556	.005	.946	.000	.005	.050
	Greenhouse- Geisser	.556	1.000	.556	.005	.946	.000	.005	.050
	Huynh-Feldt	.556	1.000	.556	.005	.946	.000	.005	.050
	Lower-bound	.556	1.000	.556	.005	.946	.000	.005	.050
test * GROUP	Sphericity Assumed	185.556	1	185.556	1.540	.226	.056	1.540	.223
	Greenhouse- Geisser	185.556	1.000	185.556	1.540	.226	.056	1.540	.223
	Huynh-Feldt	185.556	1.000	185.556	1.540	.226	.056	1.540	.223
	Lower-bound	185.556	1.000	185.556	1.540	.226	.056	1.540	.223
Error(test)	Sphericity Assumed	3133.497	26	120.519					
	Greenhouse- Geisser	3133.497	26.000	120.519					
	Huynh-Feldt	3133.497	26.000	120.519					
	Lower-bound	3133.497	26.000	120.519					
a. Computed using alpha = .05									

Tests of Between-Subjects Effects								
Measure: MEASURE_1								
Transformed Variable: Average								
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power ^a
Intercept	234554.767	1	234554.767	354.286	.000	.932	354.286	1.000
GROUP	1966.053	1	1966.053	2.970	.097	.103	2.970	.382
Error	17213.287	26	662.049					
a. Computed using alpha = .05								